L4, L3, L2, L1, C0, R1, R2, R3, R4, R5).

Results.– The lateral deviation of the subjective point position depended ($P < 0.05$) on the group, location, and group x location interaction, due to rightward deviation of points L4, L2 and C0, and leftward deviation of the R4 point in neglect patients. This difficulty did not depend on the body side (anterior, posterior) and line (shoulder, navel). The estimate was fair in non-neglect patients and control subjects. Variability (standard deviation) also depended on the group, site and group x site interaction, with a global increase in patients, especially when neglect, which in this group predominated on the neglected side. Neglect patients also showed a narrowing of the L4–C0 distance and at a lesser degree of C0–R4.

Discussion.– Deformations of perceptual body representations extend to various lateral body points and not only to the midline, with a lateral gradient associating an ipsilesional shift of the reference center (the medial point) and a bilateral narrowing around this point, predominating on the neglected side.

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Brain correlates of spatial biases in neglect patients

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Keywords: Spatial representations; Subjective straight ahead; Subjective vertical; Spatial neglect

Objectives.– Hemispheric lesions impair space and body representations, especially in case of right injury and spatial neglect. The ipsilesional bias of the subjective straight ahead (SSA) and the contralesional tilt of the subjective vertical (SV) are well known. In parallel, patients show clinical disorders in visual exploration tasks, and can present with balance disorders. Here, we analysed the neuroanatomical correlates of these spatial difficulties.

Patients and methods.– The analysis focused on right hemisphere lesions of 22 neglect and 21 non-neglect patients (using MRIcro), and their relationship with performance in experimental tasks (SV and SSA), clinical tests (line bisection, cancellation) and balance assessment (PASS). A statistical method based on regression analysis was used to highlight areas of brain lesions which best explained biases and errors (Matlab-based VLSM code; $P < 0.01$).

Results – In each test, performance was characterized by a spatial bias in neglect patients ($P < 0.05$). The deviation of the subjective vertical was best explained by lesions of the posterior parietal cortex (Brodmann area 40), and the lateral translation of the body midline by more anterior lesions of this same cortex (Brodmann area 40) and of subcortex. Spatial errors in cancellation correlated with right frontal and anterior subcortical lesions, and in bisection with lesions centred on the parietal and frontal cortices and centrum ovale-internal capsule. Imbalance was preferentially associated with subcortical lesions (posterior thalamus and internal capsule).

Conclusion.– Specific right hemisphere lesions are implicated in spatial representation biases and manifestations of spatial neglect. We found a cortical dissociation for the SV and SSA. This suggests the specific involvement of corresponding cortical and subcortical structures in spatial information processing, depending on the type of task and cognitive demand.

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Right unilateral spatial neglect in the acute phase of the stroke

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Keywords: Evaluation; Stroke; Unilateral spatial neglect

Introduction.– Unilateral spatial neglect (USN) after a left stroke is reported infrequently, no often studied and poorly characterized. The purpose of this prospective study was to analyze right-side USN in the acute phase of the stroke.

Materials and methods.– This bicentric prospective study included patients affected by an ischemic or haemorrhagic left stoke in the first fifteen days. Our evaluation tool includes a clinical neurological examination, four paper-and-pencil nonverbal tests (from the BEN), four items of behavioural evaluation in the activities of daily living (from the ECB) and a descriptive analysis of MRIs of the initial lesions of the patients.

Results.– Forty-seven patients were assessed; eleven were excluded because of severe oral comprehension difficulties. Thirty-six patients were finally included, of which sixteen (44.4%) patients showed some degree of right USN (defined by at least two positive results from the eight paper-and-pencil and behavioural evaluation tests). The patients with right USN significantly presented a higher initial NIHSS ($P < 0.001$), more verbal disorders ($P < 0.001$) and right hemiplegia ($P = 0.03$). Line bisection and figure copying tests are positive to 14 (38.9%) and 13 (36.1%) patients respectively. The activities of daily living evaluation showed pathological results in 13 (36.1%) patients. Twelve of the 16 patients with USN had at least five positive tests among the eight paper-and-pencil tests and ecological evaluations. The MRI analysis showed a high frequency of infracortical lesions, notably in the periventricular white matter.

Discussion.– In this study, the use of nonverbal tests and an ecological evaluation revealed right USN in 44.4% of patients with acute left stroke and demonstrated the important consequences right USN has on activities of daily living.

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Preliminary validation of an attention assessment questionnaire for patients with severe traumatic brain injury

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Keywords: Severe traumatic brain injury; Attention; Activity limitations; RASB

Attention disorders are a sequel almost constant and very debilitating in severe traumatic brain injury (TBI). Yet, very few tools are available to evaluate them in terms of activity limitations as defined by the CIF. The Rating Scale of Attentional Behaviour (RASB), developed by Ponsford and Kinsella in 1991, offers interesting possibilities in this area.

Aim.– Put at the clinicians' disposal a validated French version of the RSAB.

Subjects et methods.– The 14 questions of the RASB have been carefully translated by bilingual professionals with verification by means of a back-translation. The scale was suggested to 27 patients suffering from severe TBI (self-evaluation), 27 control subjects matching on age, sex and educational level, 27 professionals and 27 patients' relatives (hetero-evaluation). Patients were also assessed with the Stroop test and the Wechsler Test Codes (DSST).

Results.– The RSAB is sensitive and discriminates well the average total score of patients (19.5) from that of controls (13.4). We can use the raw scores without conversion to standard scores because we observed no significant influence of age, sex, educational level, and with the patients, of the GCS, the coma length

and the period test-trauma. The internal consistency of the questionnaire was good with a Cronbach α coefficient to 0.80. Reproducibility between relatives and patients was good, but these assessments significantly differ from that of the professionals, who tended to rate more severely the disorders. Unlike the Australian authors, we found no significant correlation between the patients' RSAB scores and their results on the Stroop Test and DSST.
Discussion and conclusion.– In view of the first results, the properties of the French version of the RASB appear promising in terms of easiness to handle, sensitivity, reproducibility and internal consistency. Further research is necessary on the concurrent validity in order to obtain a complete validation of the tool.

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Calculation and number processing troubles in patients with traumatic brain injury

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Keywords: Traumatic Brain Injury; Ecological assessment; Calculation; Number processing

Cognitive impairment is a common and prominent sequela of traumatic brain injury (TBI). Number processing and mental arithmetic require the intervention of multiple cognitive functions. These abilities may be altered, thereby compromising patient autonomy. However, these disorders are rarely evaluated. Validated tests often lack sensitivity unsuited for these patients.
Aim.– The aim of our study is to assess number processing and calculation in patients with TBI and their impact on daily activities.
Materials and methods.– Using a numerical processing battery (BENQ), we assessed the long-term effects of severe or moderate TBI in patients who returned home. BENQ is a standardized ecological scale, which includes 11 tasks corresponding to manipulation of numbers in situations similar to those of everyday life: telling time, estimating prices and making change. The results are compared with an analytic battery: EC301 and an estimation task extracted from TLC2.
Results.– We included 8 patients aged from 29 to 57 years old (mean 44 years old). The average total score on the BENQ is 35.87 on 41 (SD = 2.85). Three subjects obtained a pathological score in both the BENQ and the estimation task of TLC2. The patient who had the lowest score at the BENQ also obtained the lowest score in the EC301. Specific difficulties in estimation and problem resolving emerged from the evaluation.
Discussion.– We have highlighted in ecological situations calculation and number processing deficits in patients with traumatic brain injury. The BENQ is therefore a good assessment tool in patients with TBI. Thus, deficits can be objectified and appropriately rehabilitated. Based on our study, this test is currently being revised in order to improve its psychometric qualities.

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Neuropsychological evaluation of the abilities necessary to return to drive after a brain damage

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Keywords: Ability to drive; Brain damage; Neuropsychological evaluation

Objective.– The purpose of this work was to pre-test a neuropsychological assessment, evaluating the abilities necessary to return to driving after brain damage. Physical medicine and rehabilitation teams are regularly confronted with this problematic. We know that a pluridisciplinary assessment (physician, neuropsychologist, work therapy specialist, driving school teacher) is necessary. However, an important amount of research remains to be done in order to establish a harmonious set of tests and to help make changes to current regulations.
Material/Patients and method.– Based on the cognitive model of driving of Michon and on the works of C. Fattal since 1994, we elaborated a neuropsychological series of tests assessing various cognitive functions necessary to drive: attention, executive and visuospatial disorders. This protocol was conducted with a group of 89 patients with brain damage (brain injury, stroke, tumor. . .). Then, subjects were assessed by an approved driving school teacher during five sessions, especially trained for this type of pathology and after that the patients were divided into two groups: "able to resume driving" or "unable to resume driving".
Results.– On the whole, all the participants were under the normative average for most of tests. But the differences in performance between the two groups were statistically significant. Moreover, from the 70th patient included and onward, and although the pre-necessary statistical requisites were not entirely respected (effective of the "inapt" group too small) we used the double-blind method and predicted the aptitude or the inaptitude of each patient: this prediction appeared in conformity with the conclusion of the driving teacher for the last 20 patients.
Discussion.– Our results authorize us to think that it is possible to predict the capacity or incapacity of resuming driving after brain damage and thus by using specifically selected tests associated with an ecological assessment.

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Conscious behavior after traumatic brain injury: Anatomo-functional support and therapeutic prospects

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Keywords: Coma; Consciousness; Tegmentum; Thalamus; Basal ganglia; Default-mode network; Precuneus

Objective.– Most brain-injured patients with severe and chronic consciousness disorders are in a therapeutic deadlock. This concerns mainly vegetative or neurovegetative patients, and patients in minimally conscious state. Chronic coma is an exceptional condition; certain conditions of akinetic mutism, which are more frequent, can be included in severe and chronic consciousness disorders. The goal is to review the functional connectivity of conscious behaviours and relational arousal, in particular since the introduction of modern clinical imagery.
Description.– The connectivity described in this work relies mainly on two magnetic resonance imaging structural studies of the deep brain: a high-resolution atlas (voxel = 250 μm side; 4.7–Tesla) of an human anatomic piece; an extensive study of deep fascicles (diffusion tensor imaging and tractography; voxel = $1.25 \times 1.25 \times 1.5\,mm^3$; 3–Tesla) on 6 healthy subjects. The results show the support of the functional connectivity of consciousness that involves the mesencephalo-pontine tegmentum, the basal ganglia, the hypothalamus and the thalamus. These deep located regions are connected with the cortex through three main paths: thalamic, ganglionic and rostroventral. The thalamic path rises from the tegmentum, uses the central tegmental tract, and reaches the reticular and dorsomedial thalamus; from the thalamus it spreads to the cortex, the limbic system, the striatum and the pallidum. The ganglionic path uses the lenticular